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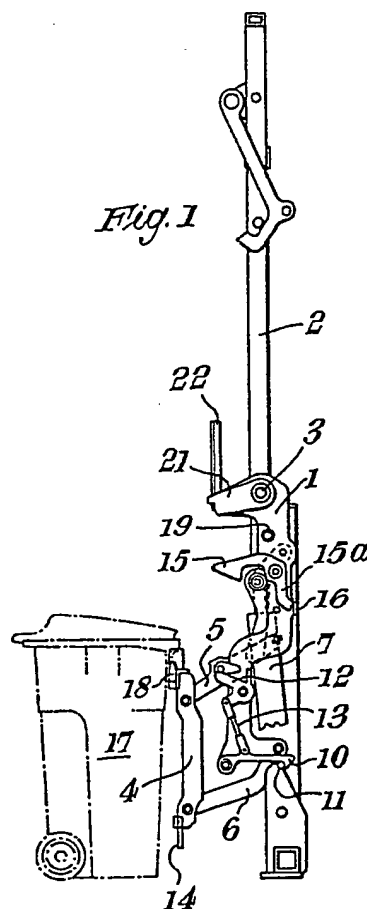
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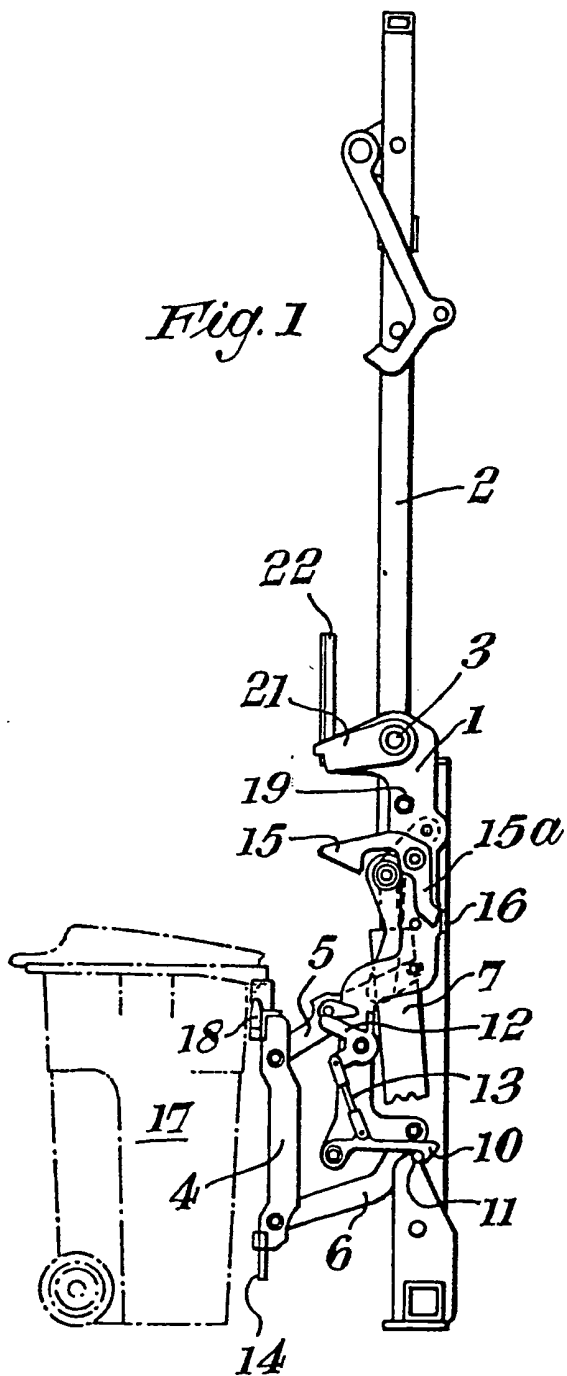
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## (54) Container emptying mechanisms

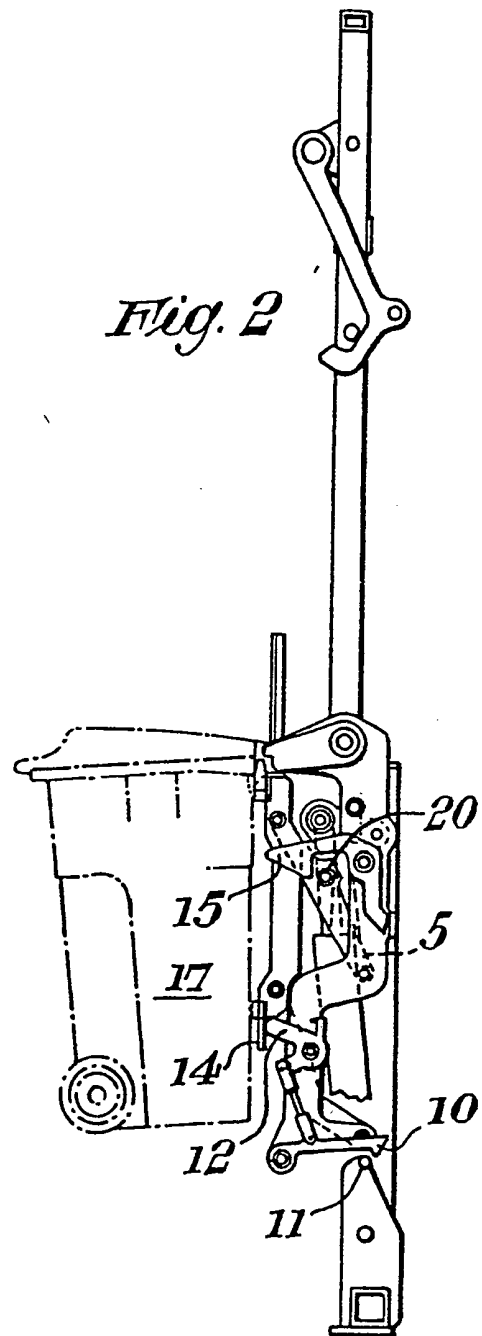
(57) A mechanism for lifting and inverting a container to discharge its contents, comprising a first frame 1 mounted on a support 2 for movement about pivot 3, a second frame 4 mounted on the first frame by a parallelogram linkage 5, 6 and adapted to engage a container 17, the second frame having a first, lower position spaced from the first frame and a second, raised, position adjacent the first frame, so that by moving the second frame from its lower to its raised position by ram 7, the container is lifted while being held upright, and by then further extending the ram the first frame is pivoted so that the container is further lifted and inverted. A latch 10, 11 is provided between the first frame and the support to prevent movement of the first frame until the second frame is raised, and a further latch 15 is provided between the first and second frames to inhibit relative movement of the frames when the first frame begins to pivot.

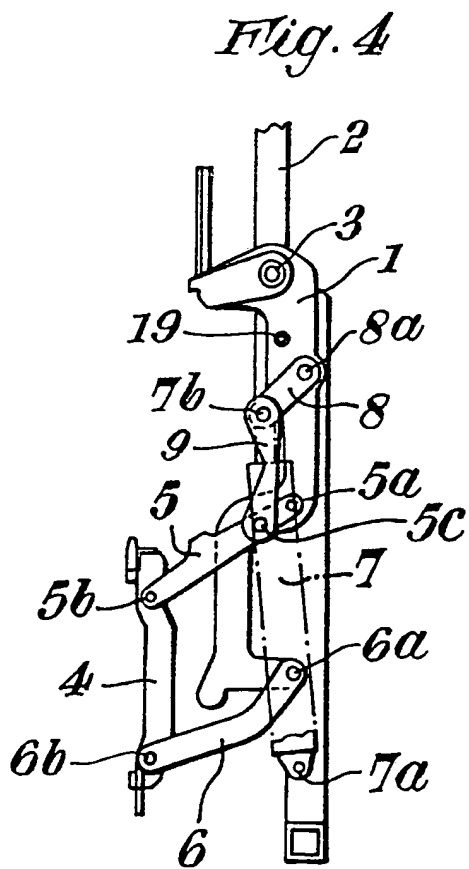
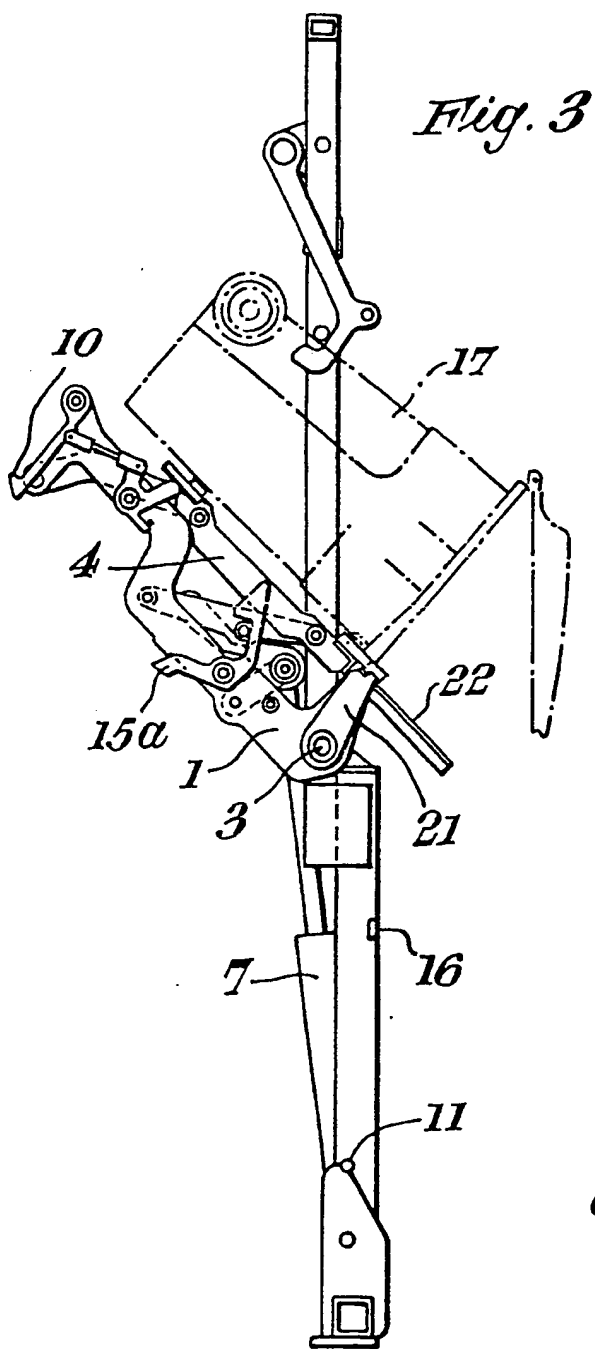


*Fig. 1*



*Fig. 2*





## SPECIFICATION

## Container emptying mechanisms

5 The present invention relates to mechanisms for emptying containers, and particularly concerns mechanisms which first lift then invert a container to discharge its contents.

Various mechanisms have been proposed, for use  
10 for example in the collection of refuse or other waste, in which containers filled with refuse are lifted and then upturned to discharge the waste into a vehicle, a compactor, or a container. Such mechanisms are usually mounted on the vehicle or compactor and  
15 utilise its own hydraulic power.

Hitherto, the lifting and upturning of the container have been controlled by separate hydraulic actuators, and thus a complicated and expensive interlocked control system is necessary to prevent  
20 the container from being upturned until it has been fully lifted, and to prevent the container from being lowered again until it is returned to its initial upright orientation.

The present invention seeks to simplify the  
25 construction of such mechanisms and their controls, by providing a system for lifting and upturning a container which is operated by a single actuating device and requires no hydraulic control interlocks.

According to the present invention, a mechanism  
30 for lifting and upturning a container comprises a first frame mountable to a support for pivotal movement about a first horizontal pivot axis, between a first, generally vertical, position and a second, upturned position and a second frame adapted to engage a  
35 container and mounted to the first frame by upper and lower parallel pivot arms, for movement between a first lower position away from the first frame, and a second, raised, position adjacent the first frame, first releasable latching means being  
40 provided between the support and the first frame to hold the first frame in its generally vertical position, and second releasable latching means being provided between the first and second frames to  
45 hold the second frame in its raised position adjacent the first frame, the first latching means being released when the second frame is in its raised position, and the second latching means being engaged when the first frame moves out of its generally vertical position, and an actuator  
50 operatively associated with the second frame and the support to apply an upward force to the second frame.

Preferably, the actuator is a hydraulic ram connected to the second frame via a trailing link  
55 pivotally attached between the ram piston and one or more of the upper pivot arms. Advantageously the mechanism includes two upper and two lower pivot arms, with the hydraulic ram acting between them.

The first latching means preferably comprises a  
60 hook member pivotally mounted on the first frame to engage a detent on the support, the engagement being released by the second frame in its raised position contacting a release lever connected to the hook. The second latching means is advantageously  
65 comprised by a hook pivotally mounted on the first

frame to engage a detent on the second frame, the hook being released by contacting an abutment on the support when the first frame is in its vertical position.

70 One embodiment of the present invention will now be described in detail with reference to the accompanying drawings, in which:

*Figure 1* is a schematic side view of the mechanism in its rest position;

75 *Figure 2* is a view similar to *Figure 1* with the second frame lifted;

*Figure 3* is a schematic side view showing the upturned position of the first frame; and

*Figure 4* is a side view showing the general  
80 arrangement of the main mechanism members.

Referring now to *Figures 1* and *4*, the mechanism comprises a first frame 1 mounted on a support 2 at pivot 3. The first frame 1 will comprise two side members, as shown, connected by transverse  
85 elements such as bars (not shown).

A second frame 4, comprising uprights connected by transverse members, is attached to the first frame 1 by means of upper and lower pairs of parallel link arms 5 and 6, only one of each pair being shown.  
90 Upper link arm 5 is pivoted to the first and second frames at 5a and 5b respectively, and lower link arm 6 is pivoted to the first and second frames at 6a and 6b respectively.

In the embodiment shown, the actuator 7, a  
95 hydraulic ram, is pivoted to the support 2 at pivot 7a, and is connected at its upper end to the pivot 7b between two links 8 and 9. Link 8 is mounted to the first frame at 8a, and link 9 is attached to upper link arm 5 at 5c.

100 A first latch hook 10, shown in *Figure 1*, operates between the first frame 1 and a detent 11 on the support 2 to retain the first frame 1 to the support in the position shown in *Figures 1* and *2*. Bellcrank 12 is pivotally mounted on the first frame 1 and is  
105 connected to latch hook 10 by tie 13. A striker 14 is provided on second frame 4 to co-operate with bellcrank 12, as will be described later.

A second latch hook 15 is pivotally mounted to the first frame 1, and has a trip arm 15a which engages  
110 on abutment 16 on support 2 when the first frame 1 is in its *Figure 1* position. The operation of the latch hooks 10 and 15 will become apparent from the following description of the operation of the mechanism.

115 Support 2 takes the form of an open rectangular framework, and is advantageously fixed by known means to a refuse collection vehicle or to a refuse compactor or collection container. When a container is to be emptied into the vehicle, the container such  
120 as 17 is offered up to the lowered second frame 4 of the mechanism, as shown in *Figure 1*. The container will be engaged by lugs 18 on the second frame and will swing toward the second frame under its own weight when first lifted.

125 Ram 7 is then extended, and the first part of the extension of ram 7 causes the link 8 to rotate clockwise as seen in *Figures 1* and *4* until it contacts a stop 19. This rotation of link 8 causes link 9 to pull  
130 upwardly on link arm 5, and thus frame 4 is lifted to the position shown in *Figure 2*. As the second frame

4 arrives at this position, the striker 14 contacts bellcrank 12 to release the engagement of latch hook 10 with detent 11, which engagement has up till now prevented any movement of first frame 1.

- 5 With the latch hook 10 released, and link 8 abutting its stop 19, the force exerted by ram 7 causes a moment to be applied to the first frame 1 causing it to rotate clockwise from the position shown in Figure 2. As the first frame leaves this position, the trip arm 10 15a becomes disengaged from the abutment 16, allowing second latch hook 15 to engage a detent 20 on the upper link arm 5. This effectively prevents any movement of the second frame relative to the first frame, and further extension of ram 7 causes the two 15 frames to rotate in unison to the position shown in Figure 3. At this point, the contents of the container 17 will fall out, opening the lid of the container if it has one, and be deposited in the vehicle, compactor or collection container. The first frame is provided 20 with a retaining lug 21 which engages the top edge of the container to retain it in position on the second frame when the container is upturned. A chute 22 may also be provided, to avoid spillage.

To return the emptied container to ground level, 25 the ram 7 is retracted, and the operation is reversed.

During the first part of the retraction, the first and second frames rotate, locked together, to the Figure 2 position. On reaching this position the engagement of detent 16 with trip arm 15a releases the second 30 frame from the first.

Continued retraction of ram 7 causes the second frame to swing downwardly away from the first frame, and striker 14 disengages from bellcrank 12 allowing latch hook 10 to engage the detent 11 and 35 lock the first frame 1 to the support 2.

Clearly, the operation of the mechanism is achieved simply by extending and retracting a single ram, thus avoiding the necessity for complicated hydraulic or electro-hydraulic interlock circuitry. 40 Containers of any suitable size and shape may be used, provided they are open-topped and have means to hold them to the second frame 4. The containers 17 may have hinged or pivoted lids, as described, or may simply be open bins.

#### CLAIMS

1. A mechanism for lifting and tipping a container, comprising a first frame mountable to a 50 support for pivotal movement about a first horizontal pivot axis, between a first position and a second generally inverted position and a second frame adapted to engage a container and mounted to the first frame by upper and lower parallel pivot arms, 55 for movement between a first lower position away from the first frame, and a second, raised, position adjacent the first frame, first releasable latching means being provided between the support and the first frame to hold the first frame in its first position, 60 and second releasable latching means being provided between the first and second frames to hold the second frame in its raised position adjacent the first frame, the first latching means being released when the second frame is in its raised 65 position, and the second latching means being

engaged when the first frame moves out of its first position, and an actuator operatively associated with the second frame and the support to apply an upward force to the second frame.

- 70 2. A mechanism according to Claim 1, wherein the actuator is a ram acting on one or more of the pivot arms.

3. A mechanism according to Claim 2, wherein the ram has one of its ends fixed to the support, and 75 has its other end respectively connected to one or more of said pivot arms by means of a trailing link, and to the first frame by means of a further link arranged substantially parallel to the pivot arms.

4. A mechanism according to any preceding 80 Claim, wherein the first releasable latching means comprises a hook pivotally mounted on the first frame to engage a detent on the support.

5. A mechanism according to Claim 4, wherein a 85 striker mounted on the second frame contacts a release lever associated with the hook when the second frame is in its second position to disengage the hook from the detent.

6. A mechanism according to any preceding Claim, wherein the second latching means 90 comprises a second hook element pivotally mounted to the first frame for movement between an engaged and a disengaged position with respect to a second detent associated with the second frame, the second detent being engageable by the second hook 95 element only when the second frame is in its second position, and an abutment being provided on the support to contact a release means associated with the second hook element to retain the second hook element in its disengaged position while the first 100 frame is in its first position.

7. A mechanism according to Claim 6, wherein the second detent is mounted on one or more of the pivot arms.

8. A mechanism according to any preceding 105 Claim, wherein the first frame includes means to engage an upper surface of the container to secure it in position when the first frame is in its second position.

9. A mechanism according to any preceding 110 Claim, wherein the first frame includes a chute to direct material falling from the container when the first frame is in its second position.

10. A mechanism substantially as herein described with reference to Figures 1 to 4 of the 115 accompanying drawings.

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